

EQUISETUM HORSETAIL, SCOURING RUSH

(Latin: horse, bristle, from roots of *E. fluviatile* L.)

1. St regularly branched ²*E. arvense*
2. Basal internode of branch > subtending nodal sheath
- 2' Basal internode of branch < subtending nodal sheath ²*E. palustre*
3. Sheath teeth 5–10 ²*E. telmateia* ssp. *braunii*
- 3' Sheath teeth 14–28 on sterile st, 20–30 on fertile st
- 1' St unbranched or branches scattered
4. St brown, fleshy, lasting < 1 month irregularly in spring ²*E. arvense*
5. Sheath teeth 6–14 on sterile st, 6–10 on fertile st ²*E. telmateia* ssp. *braunii*
- 5' Sheath teeth 14–28 on sterile st, 20–30 on fertile st
- 4' St green, firm, lasting > 1 month ²*E. palustre*
6. Sheath teeth 5–10, persistent
- 6' Sheath teeth 10–50, gen deciduous
7. Cone tip pointed; sheath gen with 2 dark bands, 1 at base, 1 at tip; st per, gen scabrous *E. hyemale* ssp. *affine*
- 7' Cone tip rounded; sheath gen with 1 dark band, at tip; st ann (or per in s), gen not scabrous *E. laevigatum*

E. arvense L. (p. 97) COMMON HORSETAIL STS ann, of 2 kinds. STERILE ST 10–60 cm, green; basal internode of branch > subtending sheath; sheath 3–8.5 mm, ± as long as wide, teeth 6–14, 1.5–3.5 mm, dark, often joined but not fused; branch with 3–4 rounded ridges, solid. FERTILE ST 11–32 cm, unbranched, fleshy, brown, ephemeral; sheath 5–11 mm, > that of sterile st, teeth 6–10, 3–7.5 mm. Moist, disturbed areas; < 3000 m. CA-FP, MP; N.Am, Eur, Asia. ⚡IRR:1,4,7,15–17,24&SHD:2,3,8,9,14,18–23; INV.

E. hyemale L. ssp. *affine* (Engelm.) Calder & R.H. Taylor (p. 97) COMMON SCOURING RUSH ST per, of 1 kind, 60–210 cm, green, unbranched; sheath 7–17 mm, ± as long as wide, gen with 2 dark bands, 1 at base, 1 at tip, teeth 22–50, gen deciduous. SPORANGIA: cone tip pointed. Streams, moist, sandy or gravelly areas; < 2500 m. CA-FP (exc GV); N.Am (other ssp. in Eur, Asia). [var. *californicum* Milde; var. *robustum* (A. Braun) A.A. Eaton] Intermediates to *E. laevigatum* (aborted spores) are *E. × ferrissii* Clute (moist, sandy or gravelly areas; < 3000 m. CA-FP; to B.C., e US. Often mislabeled *E. laevigatum* (that sp. then mislabeled *E. kansanum*). ⚡IRR:1,7,14–17,22–24&SHD:8,9,18–21; INV, GRCVR, STBL.

E. laevigatum A. Braun (p. 97) SMOOTH SCOURING RUSH ST ann (or per in s), of 1 kind, 30–180 cm, green, unbranched; sheath

6–15 mm, longer than wide, gen with 1 dark band at tip, teeth 10–26, gen deciduous. SPORANGIA: cone tip rounded. Moist, sandy or gravelly areas; < 3000 m. CA-FP, MP, DMtns; to B.C., e US. [*E. funstoni* A.A. Eaton; *E. kansanum* J. Schaffner] ⚡IRR:1–7,14–17,22–24&SHD:8,9,18–21; INV.

E. palustre L. (p. 97) MARSH HORSETAIL ST ann, of 1 kind, 20–80 cm, green; basal internode of branch < subtending sheath; sheath 4–9 mm, longer than wide, teeth 5–10, 2–5 mm, separate; branch with 4–6 rounded ridges, hollow. RARE in CA. Marshes; < 1000 m. SnFrB (San Francisco); OR to AK, e N.Am. Reported from Lake, San Mateo cos.; scarcity poorly understood; hybrid with *E. telmateia* ssp. *braunii* known from San Mateo Co.

E. telmateia Ehrh. ssp. *braunii* (Milde) R.L. Hauke (p. 97) GIANT HORSETAIL STS ann, of 2 kinds. STERILE ST 30–100 cm, light green; basal internode of branch < subtending sheath; sheath 7–18 mm, ± as long as wide, teeth 14–28, 4–10 mm; branch with 4–5 grooved ridges, solid. FERTILE ST 17–45 cm, unbranched, fleshy, brown, ephemeral; sheath 1.5–4 cm, > that of sterile st, teeth 20–30, 5–16 mm. Stream banks, roadside ditches, seepage areas; < 1000 m. NW, CW, SW; along coast to B.C. (other ssp. in Eur, Asia). Sometimes invasive. ⚡WET:1,4–6,15–17,24&SHD:2,3,7,8,9,14,18,19–23; INV, STBL.

ISOETACEAE QUILLWORT FAMILY

W. Carl Taylor & Jon E. Keeley

Per, aquatic to terrestrial. ST buried, corm-like, 2–3-lobed, corky, brown. LVS simple, in grass-like tufts, spirally arranged on st top, erect to spreading, < 25 cm, linear above base. SPORANGIA solitary, embedded in wide lf base, < 1 cm, ± covered by a translucent membrane, either male or female; male spores > 10,000, < 0.045 mm, ± bean-shaped, gray or brown in mass; female spores 20–200, 0.2–0.7 mm, spheric, white, ± smooth, ridged, tubercled, or prickly. 1 genus, 150 spp.: worldwide. [Pfeiffer 1922 Ann Missouri Bot Gard 9:79–233]

ISOETES QUILLWORT

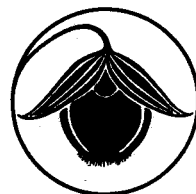
(Greek: evergreen, from the habit of some spp.) Perhaps most poorly known pteridophyte genus. Mature female spores, found in decaying lf bases or soil, critical for identification; hand lens for texture when dry, microscope with micrometer for size. Hybrids (spores flattened, highly variable) common between aquatic spp., making them less distinct.

1. Pl terrestrial (or becoming so), of seasonally wet soil, lake margins, temporary streams, vernal pools; gen < 1500 m
2. Translucent membrane covering < 75% of sporangium *I. howellii*
- 2' Translucent membrane covering > 75% of sporangium
3. Pl of wet soil; lf gen > 8 cm, > 1 mm wide at middle, rigid, almost brittle *I. nuttallii*
- 3' Pl of vernal pools; lf gen < 8 cm, < 1 mm wide at middle, soft, flexible *I. orcuttii*
- 1' Pl underwater in persistent lakes or pools; > 1500 m
4. Female spore prickly *I. echinospora*
- 4' Female spore ridged or tubercled
5. Lf abruptly tapered to tip; female spore 0.3–0.5 mm wide *I. bolanderi*
- 5' Lf gradually tapered to tip; female spore 0.5–0.7 mm wide *I. occidentalis*

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I. bolanderi Engelm. (p. 97) Pl underwater. LVS deciduous, < 20 cm, rigid, not brittle, abruptly tapered to tip, bright green; bases white to brownish. SPORANGIUM: membrane covering < 30%; male spores 0.02–0.03 mm, brown in mass; female spores 0.3–0.5 mm diam, ridged, tubercled. $2n=22$. Persistent lakes, pools; > 1500 m. KR, NCoRH, CaRH, SNH, SnBr, Wrn; to B.C., WY, NM. Hybridizes with *I. echinospora*, *I. occidentalis*. Spores mature late summer. Small pls of c SNH, NV, AZ (lf < 2.5 cm) have been called var. *pygmaea* (Engelm.) Clute.

I. echinospora Durieu (p. 97) Pl underwater. LVS ± evergreen, < 20 cm, soft, flexible, gradually tapered to tip, bright green; bases white to brownish. SPORANGIUM: membrane covering < 50%; male spores 0.02–0.03 mm, gray in mass; female spores 0.4–0.5 mm diam, prickly. $2n=22$. Persistent lakes, pools; > 1500 m. KR, n SNH; to AK, e N.Am, Eurasia. [*I. braunii* Durieu; *I. muricata* Durieu] Hybridizes with *I. bolanderi*, *I. occidentalis*. Spores mature late summer.

I. howellii Engelm. (p. 97) Pl becoming terrestrial. LVS deciduous, < 30 cm, rigid, not brittle, gradually tapered to tip, bright green; bases brownish to black. SPORANGIUM: membrane covering < 75%; male spores 0.025–0.035 mm, brown in mass; female spores 0.3–0.5 mm diam, ridged. $2n=22$. Vernal pools, lake margins; gen < 1500 m. NCoR, CaRF, SNF, SnFrB, SCoR, SCo, PR; to WA, MT, UT. Spores mature late spring, summer. Small pls of SCo, WA, Baja CA (lf < 10 cm, female spore < 0.42 mm) have been called var. *minima* (A.A. Eaton) Pfeiffer.

I. nuttallii Engelm. (p. 97) Pl terrestrial. LVS deciduous, gen > 8 cm, > 1 mm wide at middle, rigid, almost brittle, gradually tapered to tip, light green to gray-green; bases white to brownish, outermost sterile, often surrounded by several black scales. SPORANGIUM: membrane covering > 75%; male spores 0.02–0.03 mm, brown in mass; female spores 0.35–0.6 mm diam, ± shiny, ± tubercled. $2n=22$. Seasonally wet soil, temporary streams; gen < 1500 m. NCoR, CaRF, SN, n SnJV, SnFrB, SCoRO, SCo, PR; to B.C. Spores mature late spring, summer.

I. occidentalis L. Henderson (p. 97) Pl underwater. LVS evergreen, < 20 cm, rigid, brittle, gradually tapered to tip, dark green; bases brownish white. SPORANGIUM: membrane covering < 50%; male spores 0.035–0.045 mm, gray in mass; female spores 0.5–0.7 mm diam, ridged, tubercled. $2n=66$. Persistent lakes, pools; > 1500 m. KR, SNH; to B.C., Colorado. [*I. lacustris* var. *paupercula* Engelm.; not *I. lacustris* L.] Hybridizes with *I. bolanderi*, *I. echinospora*. Spores mature late summer.

I. orcuttii A.A. Eaton Pl becoming terrestrial. LVS deciduous, gen < 8 cm, < 1 mm wide at middle, soft, flexible, gradually tapered to tip, bright green, bases white to brownish, outermost fertile, often surrounded by several black scales. SPORANGIUM: membrane covering > 75%; male spores 0.02–0.025 mm, brown in mass; female spores 0.2–0.4 mm diam, ± shiny, ± smooth. $2n=22$. Vernal pools; < 1700 m. n SNH, GV, SCo, PR; Baja CA. Spores mature spring.

LYCOPODIACEAE CLUB-MOSS FAMILY

Alan R. Smith & Thomas Lemieux

Pls on ground or other pls, creeping to ± vine-like. ST: branches few–many, forked often unequally, also branching laterally or not. LVS many, simple, ± alternate, spirally arranged, small, needle- or scale-like, 1-veined, few-toothed to gen entire, those subtending sporangia gen unlike others, sometimes in cones. CONE terminal on erect st, erect. SPORANGIA solitary in lf axils; spores of 1 kind per pl, scar with 3 radiating branches. 4 genera, ± 400 spp.: worldwide, gen trop. [Øllgaard 1987 Opera Bot 92:153–178]

1. Fertile st unbranched, terminated by 1 cone LYCOPODIELLA
1' Fertile st branched, terminated by few–many cones LYCOPODIUM

LYCOPODIELLA

ST: sterile branched in 1 horizontal plane; fertile erect, unbranched, terminated by 1 cone. ± 40 spp.: gen Am. (Diminutive of *Lycopodium*)

L. inundata (L.) Holub (p. 97) BOG CLUB-MOSS Pl on ground. ST: sterile creeping, 5–15(25) cm, 0.5–1 cm wide, incl lvs; fertile gen 1–2, ± 4–6(9) cm. LVS ± 3–8 mm, 1 mm wide, those subtending sporangia ± wider at base, ± not bristle-tipped. CONE 1.5–3(6)

cm, ± 8–10 mm wide. $2n=156$. RARE in CA. Peat bogs, muddy depressions, pond margins; < 50 m (NCo), ± 1000 m (n SNH). NCo, n SNH (Nevada Co.); to AK, e N.Am, Eur, Asia. [*Lycopodium i. L.*]

LYCOPODIUM

ST: sterile branched in > 1 plane; fertile erect, branched, terminated by few–many cones. ± 40 spp.: worldwide. (Greek: wolf foot, from branch tips)

L. clavatum L. (p. 97) RUNNING-PINE Pl on ground or other pls. ST: sterile wide-creeping to ± vine-like, < 0.5 m, 0.5–1.5 cm wide, incl lvs; fertile gen many, ± 10–20 cm, few-much-branched. LVS ± 4–7 mm, 0.5–1 mm wide, those subtending sporangia ovate-trian-

gular, bristle-tipped. CONE 1–3(5) cm, ± 4–6 mm wide. $2n=68$. RARE in CA. Moist ground, swamps, rarely on trees; < 200 m. NCo; to AK, MT (also e N.Am), Caribbean, S.Am, Eur, Afr, Asia.

MARSILEACEAE MARSILEA FAMILY

Alan R. Smith & Thomas Lemieux

Pl gen aquatic, gen rooted in, often stranded on mud; rhizome creeping, slender, branched. LVS floating, emersed, or out of water, ± alike; blade 1-palmate or 0, << petiole; veins not or repeatedly forked, free or netted. SPORANGIA in stalked, spheric or ± flat-ovoid, hard cases of 1 kind, near petiole base. SPORES large (female) and small (male), in separate sporangia. 3 genera, ± 70 spp.: esp temp.

